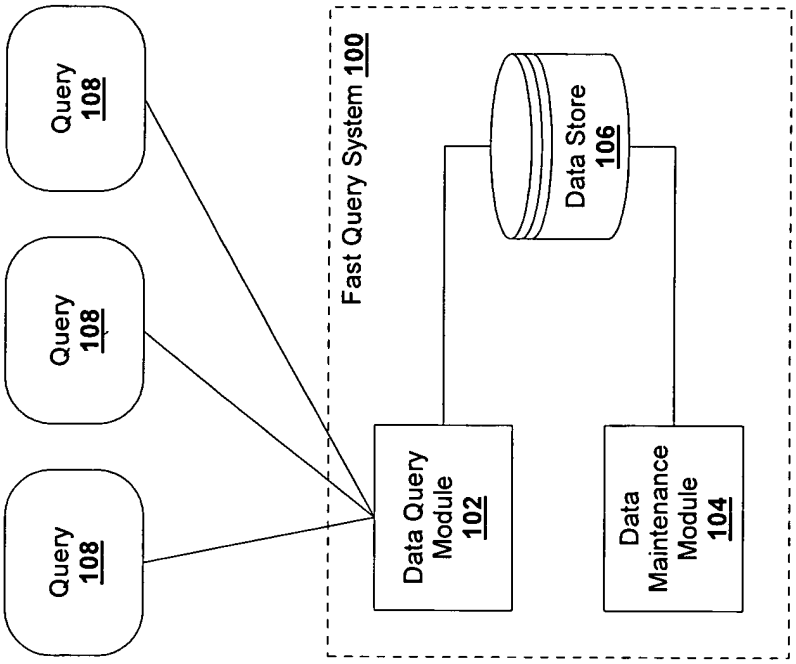
Query 108
Query 108
Query 108
Fast Query System 100
Data Store 106
Data Query Module 102
Data Maintenance Module 104

FIG. 1

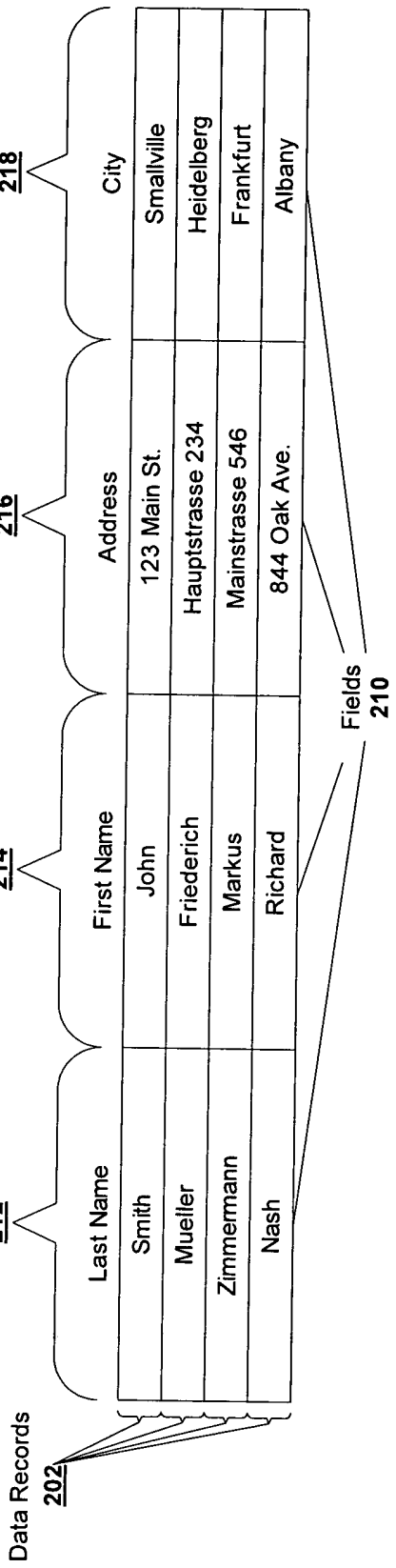
Data Records
202
Last Name Attribute
212
First Name Attribute
214
Address Attribute
216
City Attribute
218
Last Name
First Name
Address
City
Smith
John
123 Main St.
Smallville
Mueller
Friederich
Hauptstrasse 234
Heidelberg
Zimmermann
Markus
Mainstrasse 546
Frankfurt
Nash
Richard
844 Oak Ave.
Albany
Fields
210

FIG. 2

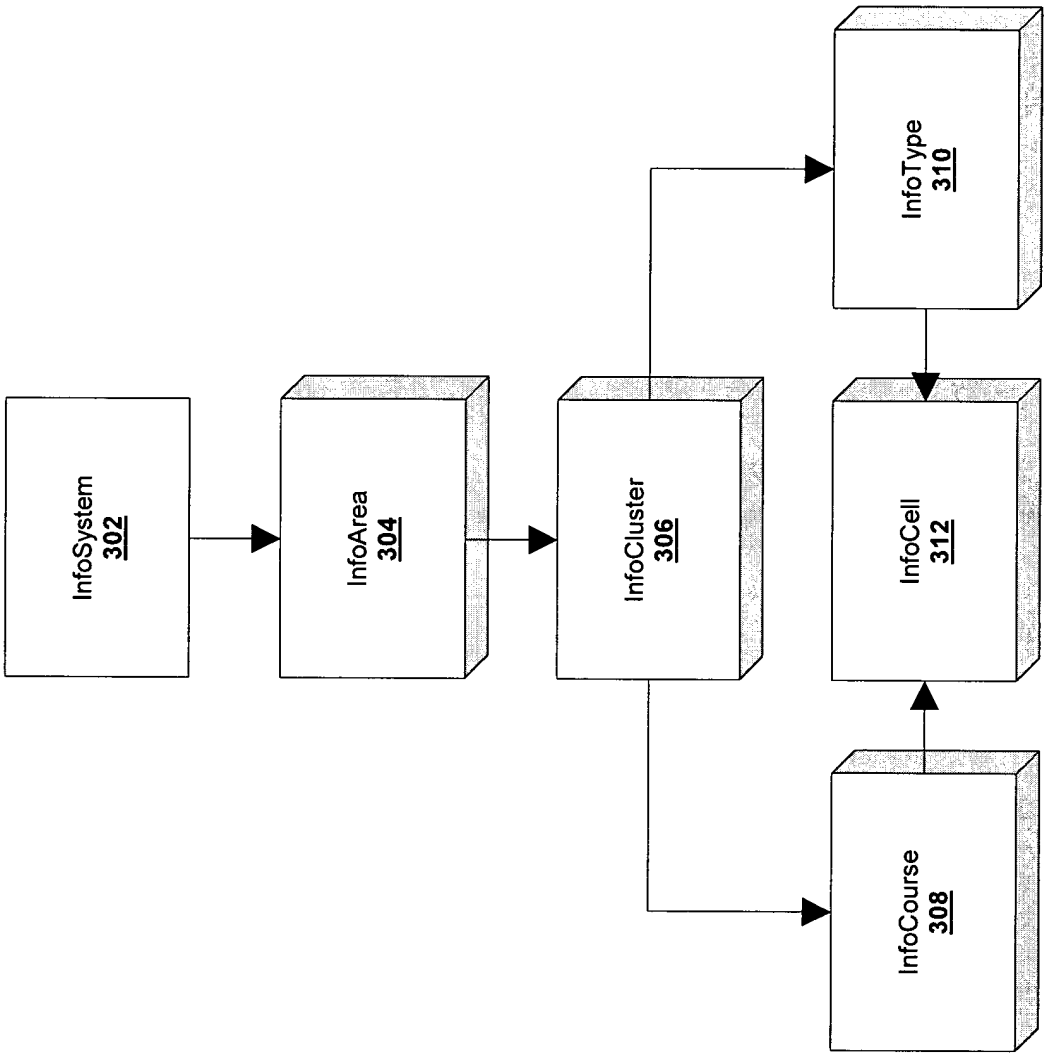
InfoSystem
302
InfoArea
304
InfoCluster
306
InfoType
310
InfoCell
312
InfoCourse
308

FIG. 3

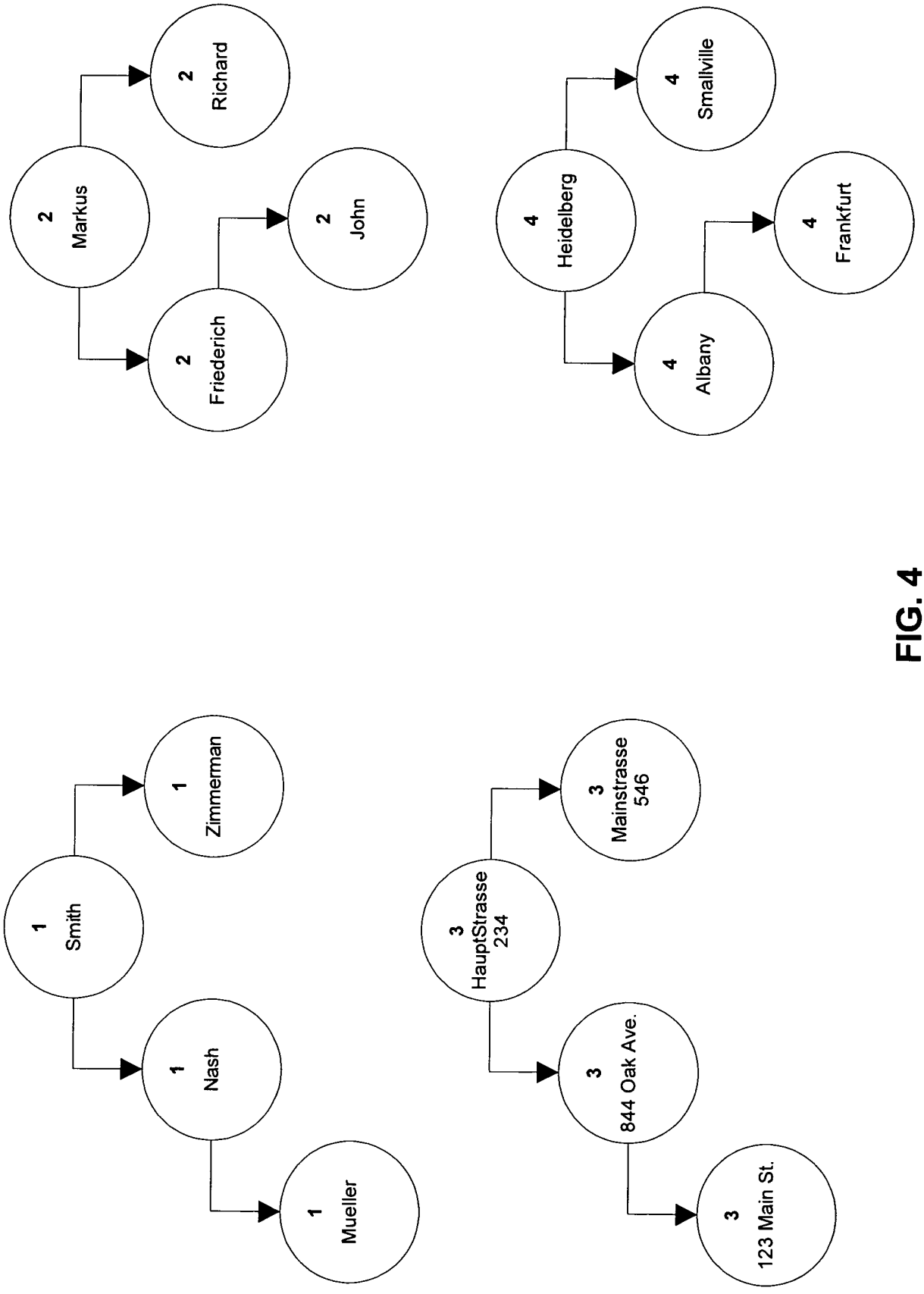
2 Markus
2 Richard
2 Friederich
2 John
4 Heidelberg
4 Smallville
4 Albany
4 Frankfurt
1 Smith
1 Zimmerman
1 Nash
1 Mueller
3 HauptStrasse 234
3 Mainstrasse 546
3 844 Oak Ave.
3 123 Main St.

FIG. 4

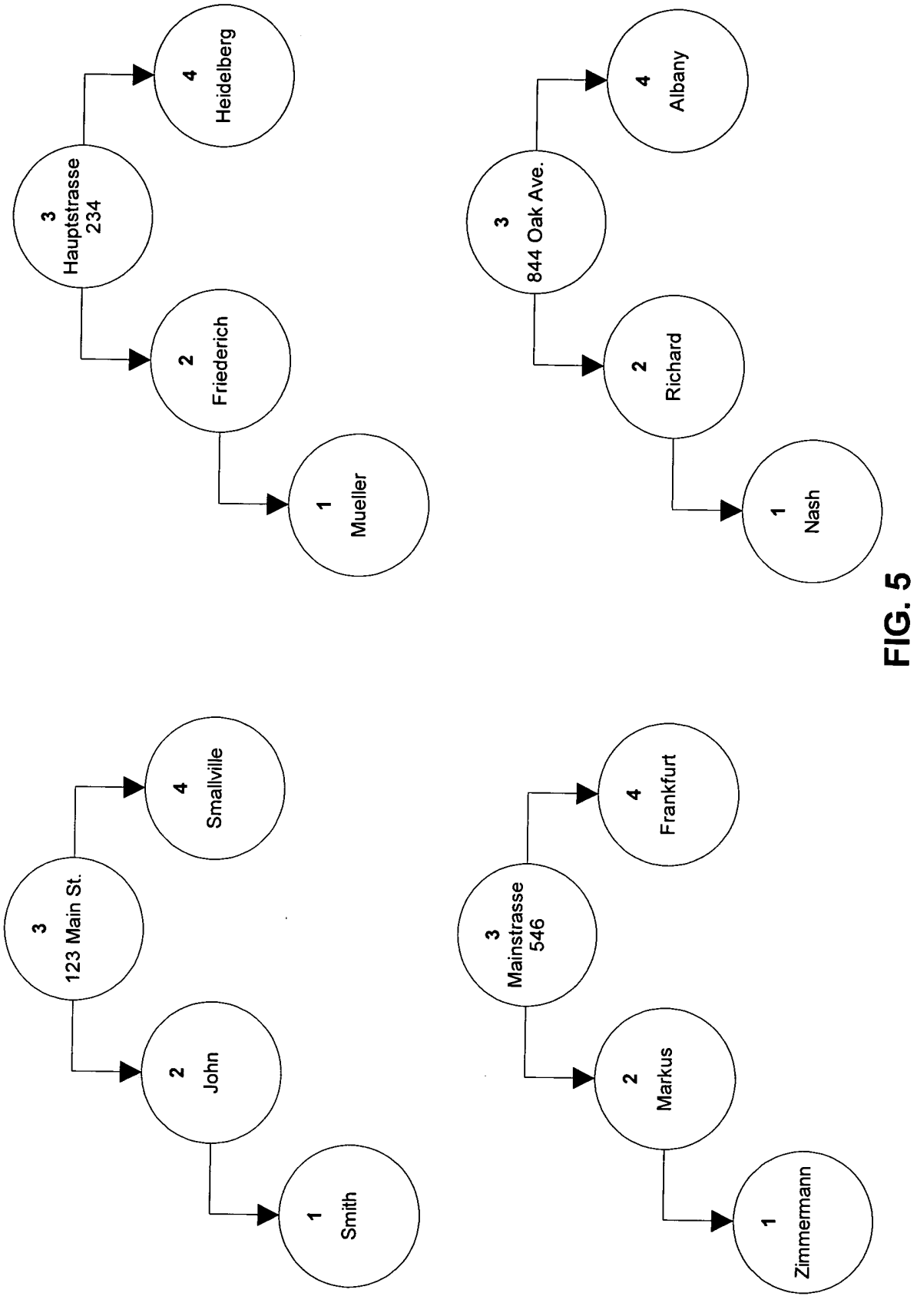
1
Mueller
2
Friederich
3
Hauptstrasse
234
4
Heidelberg
1
Nash
2
Richard
3
844 Oak Ave.
4
Albany
1
Smith
2
John
3
123 Main St.
4
Smallville
1
Zimmermann
2
Markus
3
Mainstrasse
546
4
Frankfurt

FIG. 5

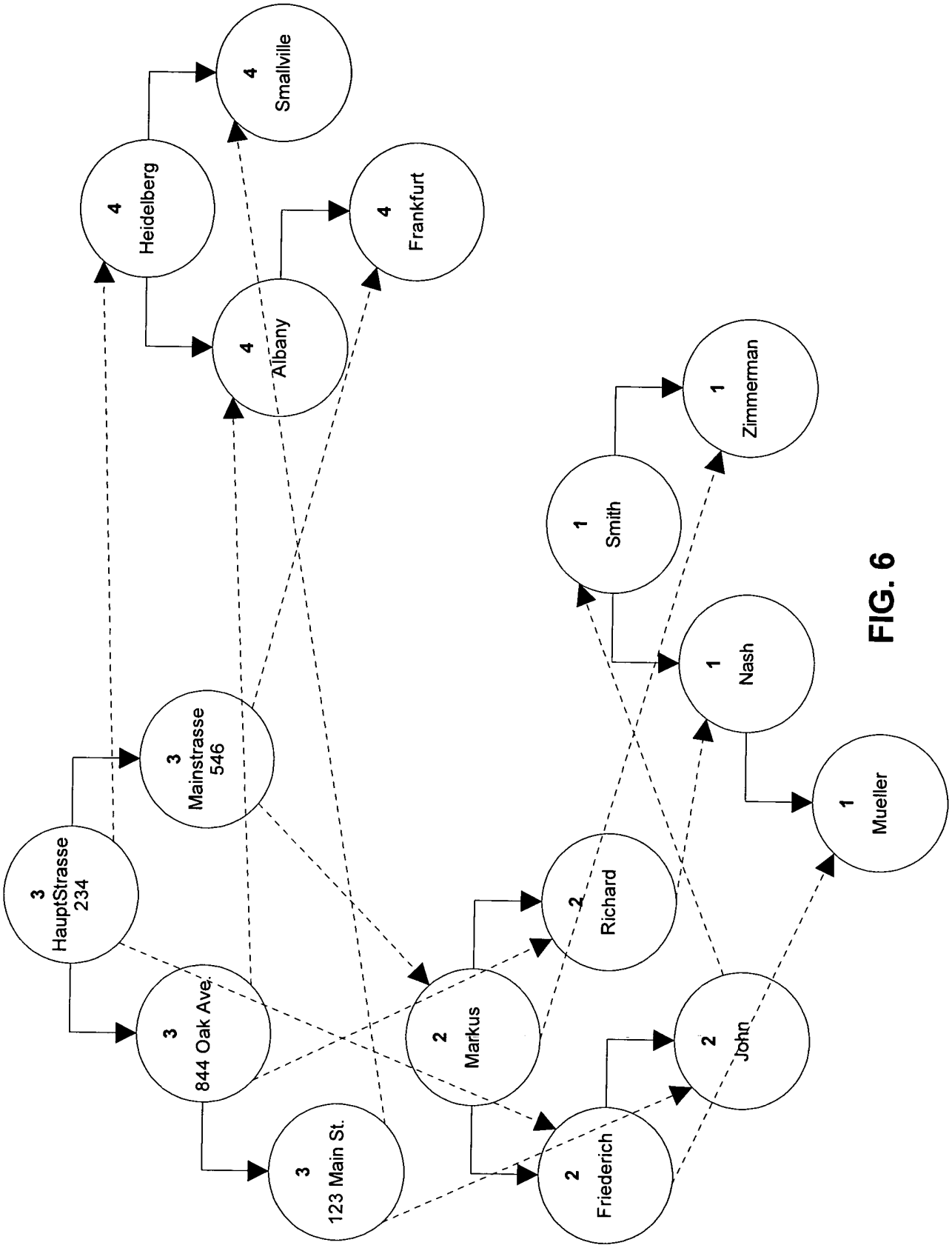
4 Smallville
4 Heidelberg
4 Frankfurt
4 Albany
1 Zimmerman
1 Smith
1 Nash
1 Mueller
3 Mainstrasse 546
3 HauptStrasse 234
3 844 Oak Ave.
3 123 Main St.
2 Richard
2 Markus
2 John
2 Friederich

FIG. 6

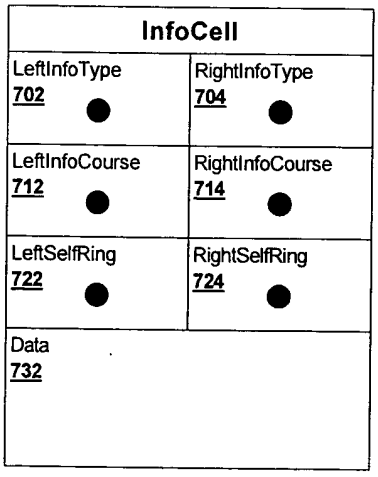
InfoCell
LeftInfoType
702
RightInfoType
704
LeftInfoCourse
712
RightInfoCourse
714
LeftSelfRing
722
RightSelfRing
724
Data
732

FIG. 7

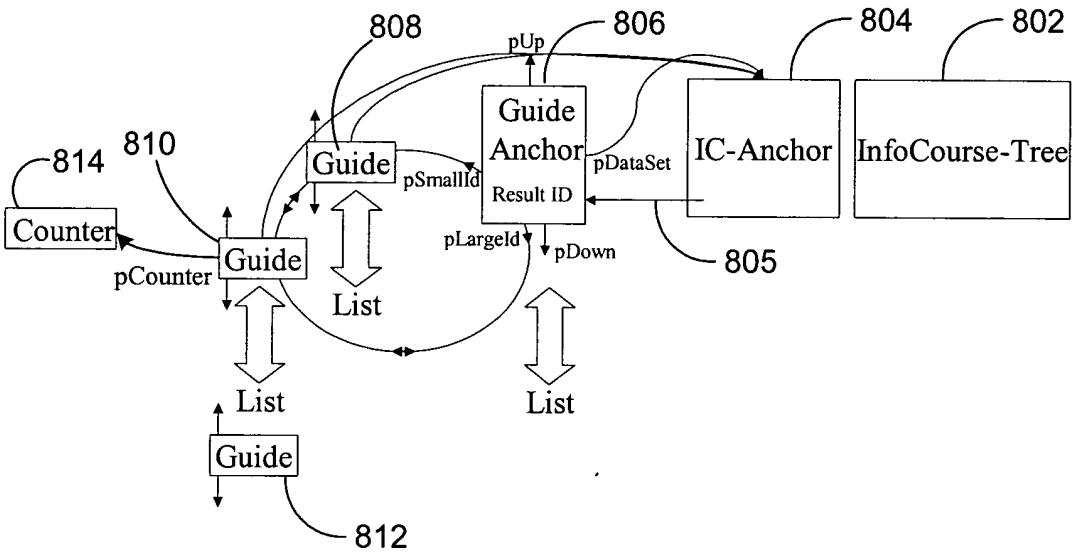
808
pUp
806
804
802
Guide
Anchor
Result ID
IC-Anchor
InfoCourse-Tree
814
810
Guide
pSmallId
pDataSet
Counter
Guide
pLargeId
pDown
805
pCounter
List
List
List
Guide
812

FIG. 8

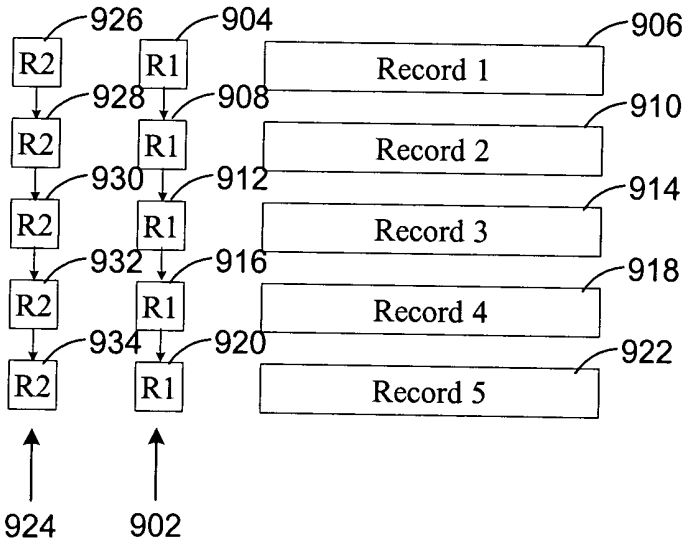
926
904
906
R2
R1
Record 1
928
908
910
R2
R1
Record 2
930
912
914
R2
R1
Record 3
932
916
918
R2
R1
Record 4
934
920
922
R2
R1
Record 5
924
902

FIG. 9

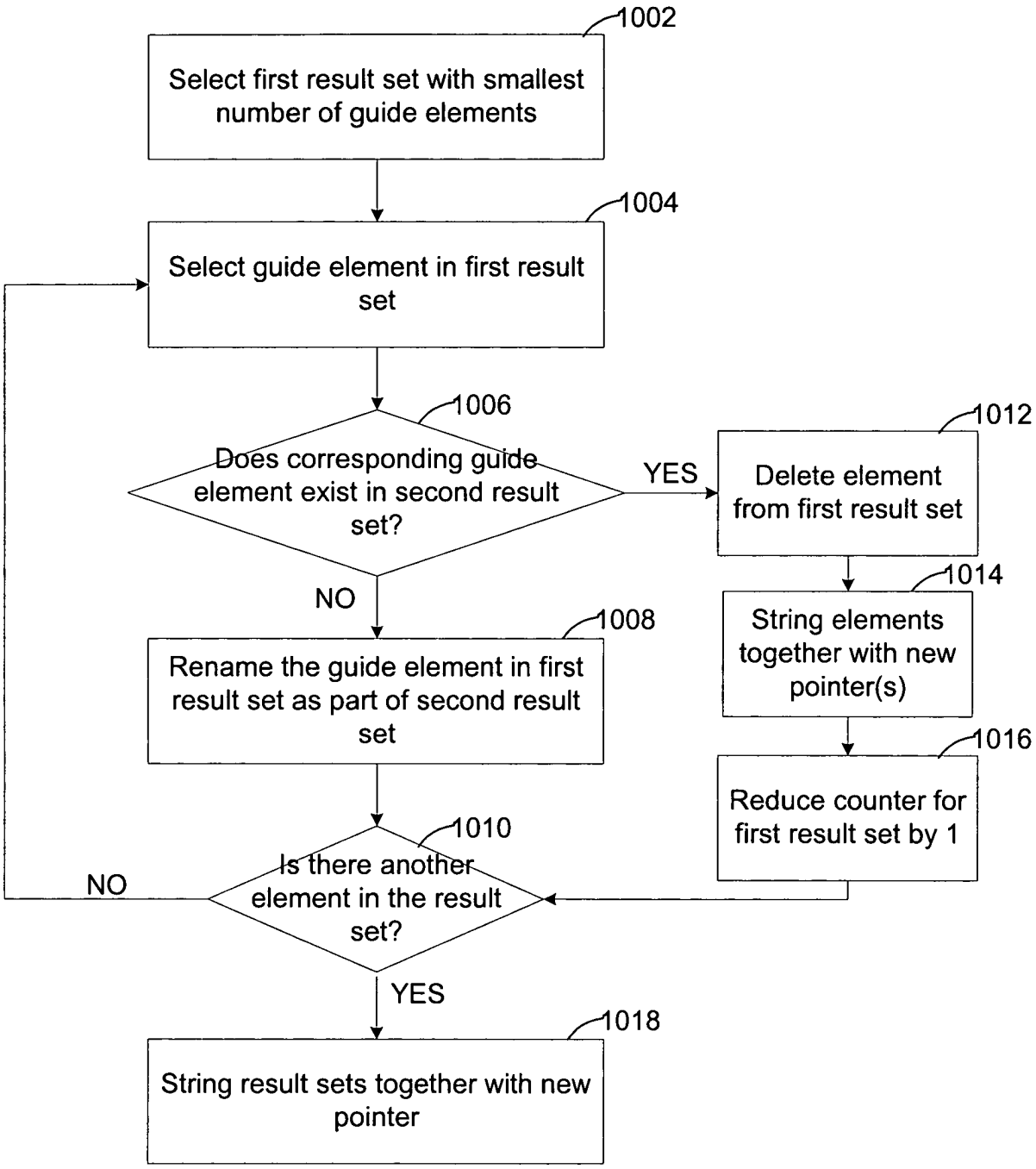
1002
Select first result set with smallest number of guide elements
1004
Select guide element in first result set
1006
Does corresponding guide element exist in second result set?
YES
1012
Delete element from first result set
1014
String elements together with new pointer(s)
1016
Reduce counter for first result set by 1
NO
1008
Rename the guide element in first result set as part of second result set
1010
Is there another element in the result set?
NO
YES
1018
String result sets together with new pointer

FIG. 10

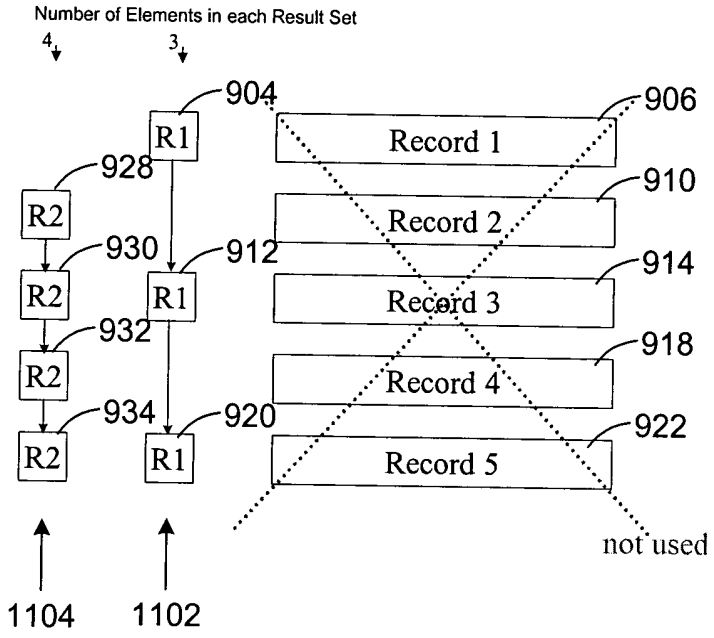
Number of Elements in each Result Set
4
3
904
906
R1
Record 1
928
910
R2
Record 2
930
912
914
R2
R1
Record 3
932
918
R2
Record 4
934
920
922
R2
R1
Record 5
not used
1104
1102

FIG. 11

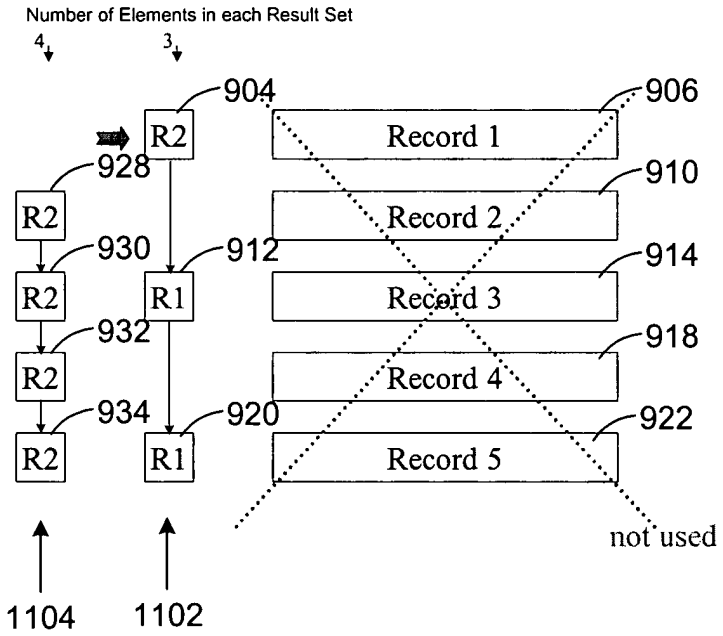
Number of Elements in each Result Set
4
3
904
906
R2
Record 1
928
910
R2
Record 2
930
912
914
R2
R1
Record 3
932
918
R2
Record 4
934
920
922
R2
R1
Record 5
not used
1104
1102

FIG. 12

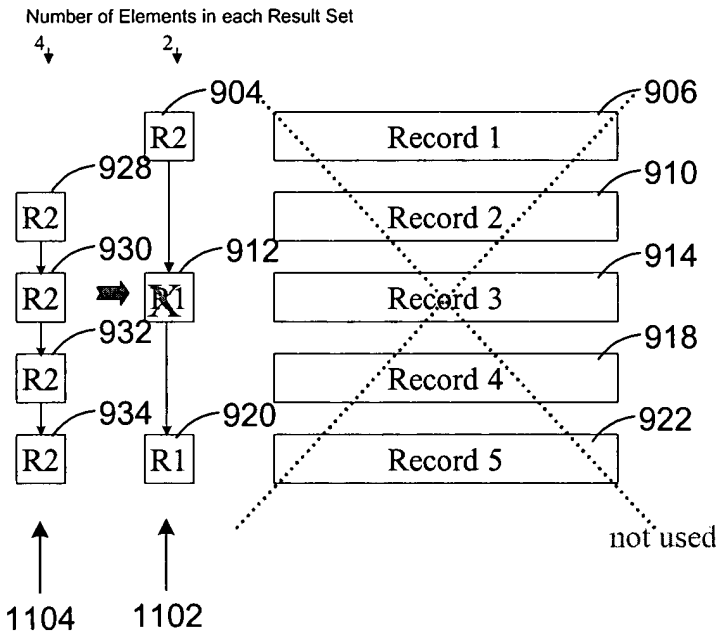
Number of Elements in each Result Set
4
2
904
906
R2
Record 1
928
910
R2
Record 2
930
912
914
R2
R1
Record 3
932
918
R2
Record 4
934
920
922
R2
R1
Record 5
not used
1104
1102

FIG. 13

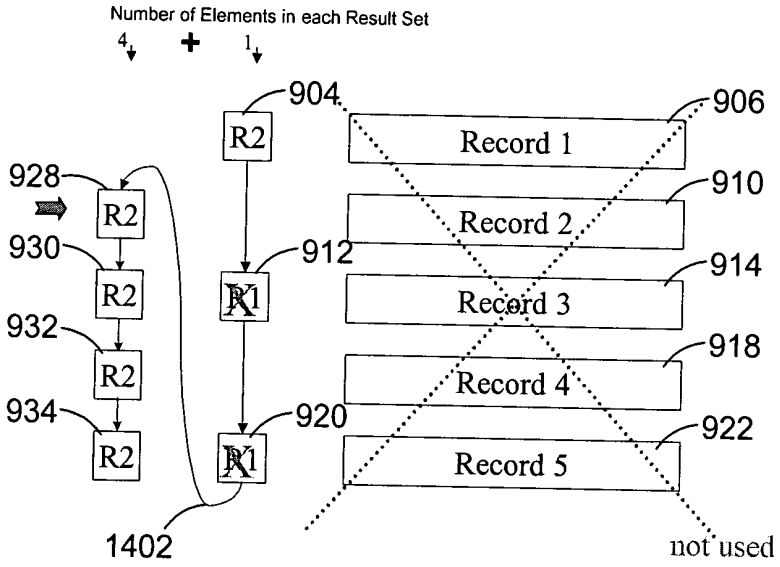
Number of Elements in each Result Set
4
+
1
904
906
R2
Record 1
928
910
R2
Record 2
930
912
914
R2
R1
Record 3
932
918
R2
Record 4
934
920
922
R2
R1
Record 5
1402
not used

FIG. 14

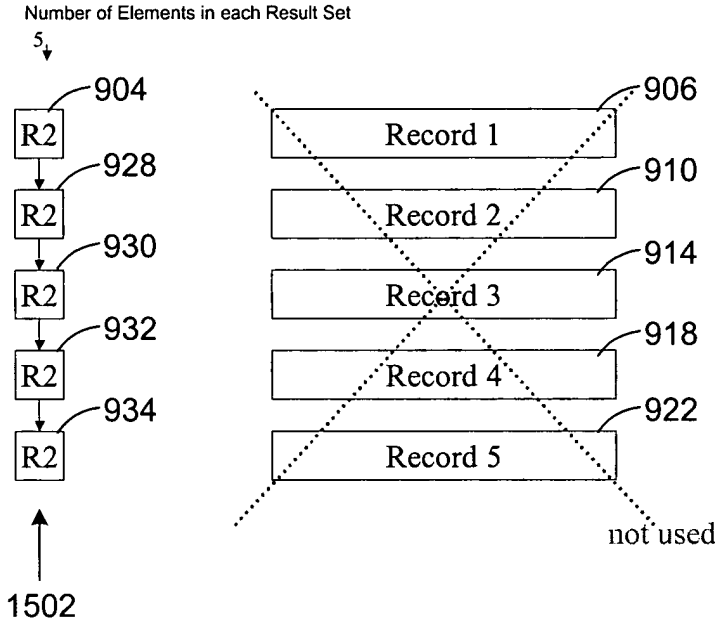
Number of Elements in each Result Set
5
904
R2
928
R2
930
R2
932
R2
934
R2
1502
906
Record 1
910
Record 2
914
Record 3
918
Record 4
922
Record 5
not used

FIG. 15

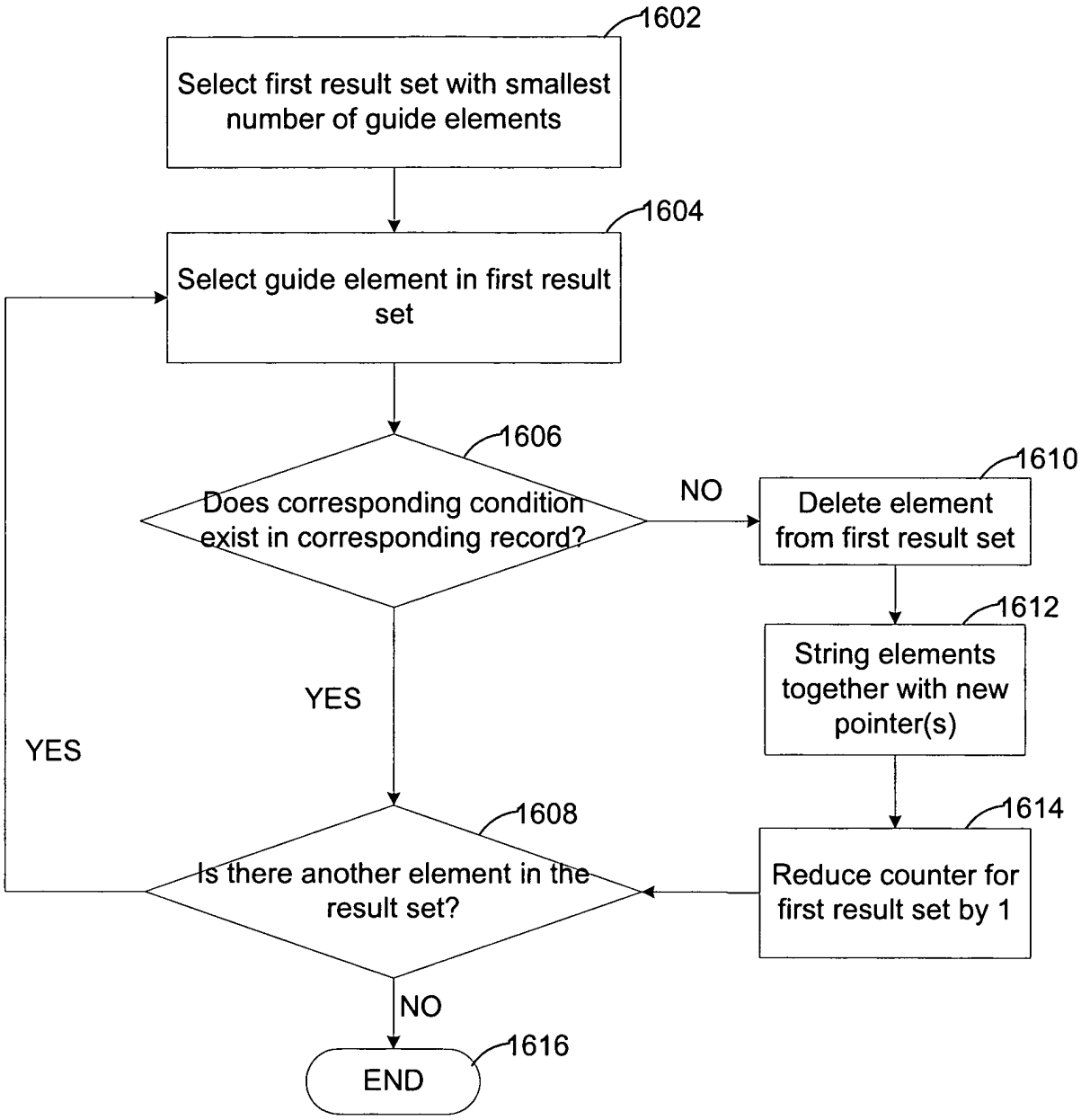
1602
Select first result set with smallest number of guide elements
1604
Select guide element in first result set
1606
Does corresponding condition exist in corresponding record?
NO
1610
Delete element from first result set
1612
String elements together with new pointer(s)
1614
Reduce counter for first result set by 1
YES
YES
1608
Is there another element in the result set?
NO
1616
END

FIG. 16

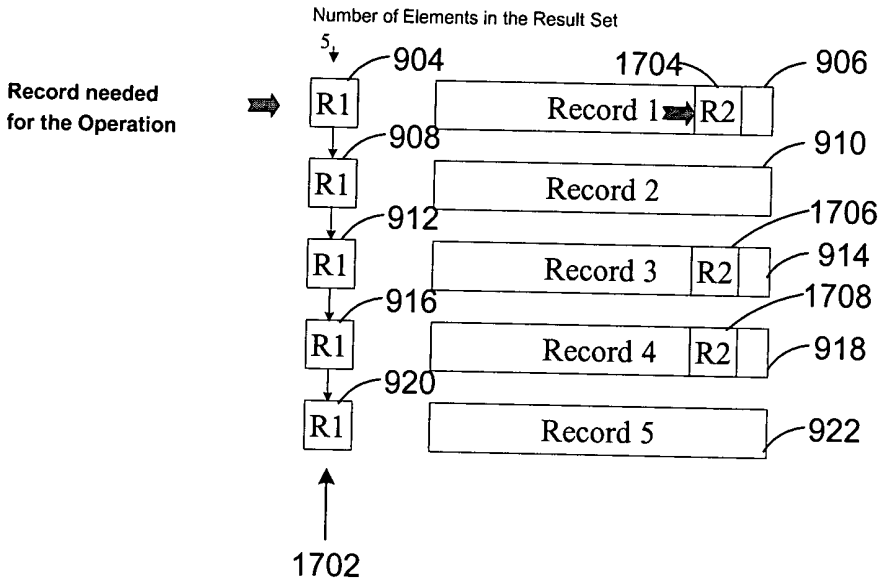
Number of Elements in the Result Set
5
Record needed for the Operation
904
1704
906
R1
Record 1
R2
908
910
R1
Record 2
912
1706
R1
Record 3
R2
914
916
1708
R1
Record 4
R2
918
920
R1
Record 5
922
1702

FIG. 17

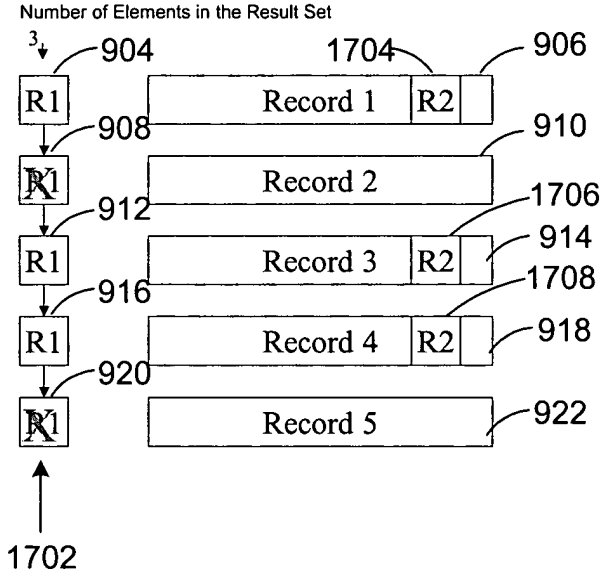
Number of Elements in the Result Set
3
904
1704
906
R1
Record 1
R2
908
910
R1
Record 2
912
1706
R1
Record 3
R2
914
916
1708
R1
Record 4
R2
918
920
R1
Record 5
922
1702

FIG. 18

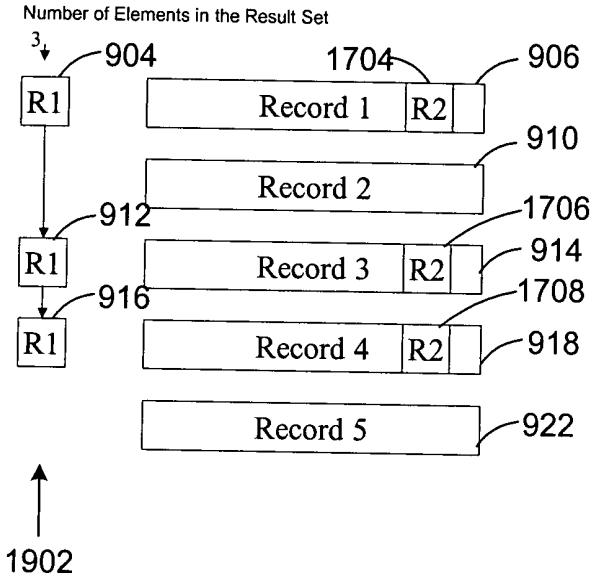
Number of Elements in the Result Set
3
904
1704
906
R1
Record 1
R2
910
Record 2
912
1706
R1
Record 3
R2
914
916
1708
R1
Record 4
R2
918
Record 5
922
1902

FIG. 19

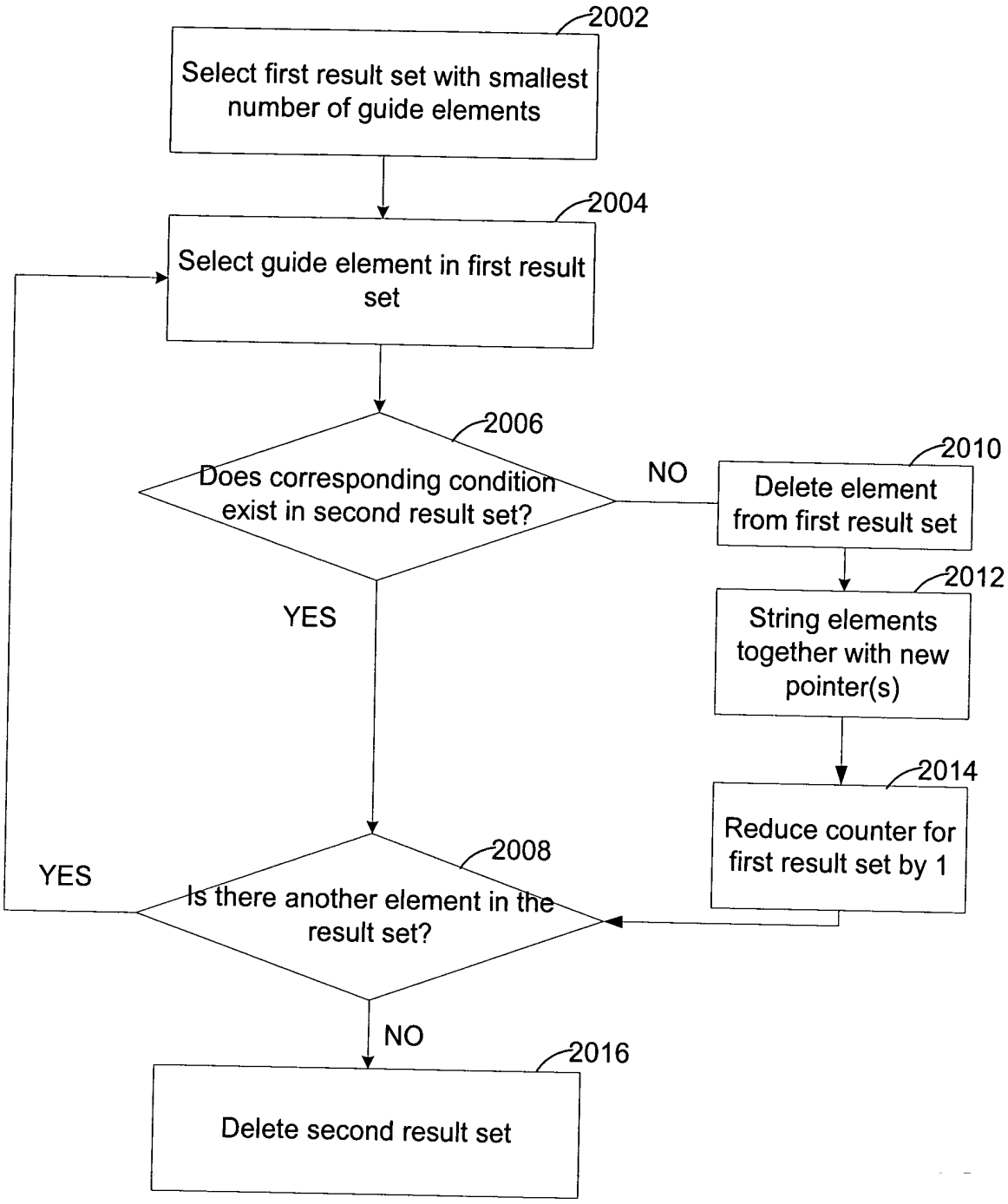
2002
Select first result set with smallest number of guide elements
2004
Select guide element in first result set
2006
Does corresponding condition exist in second result set?
NO
2010
Delete element from first result set
2012
String elements together with new pointer(s)
2014
Reduce counter for first result set by 1
YES
2008
Is there another element in the result set?
YES
NO
2016
Delete second result set

FIG. 20

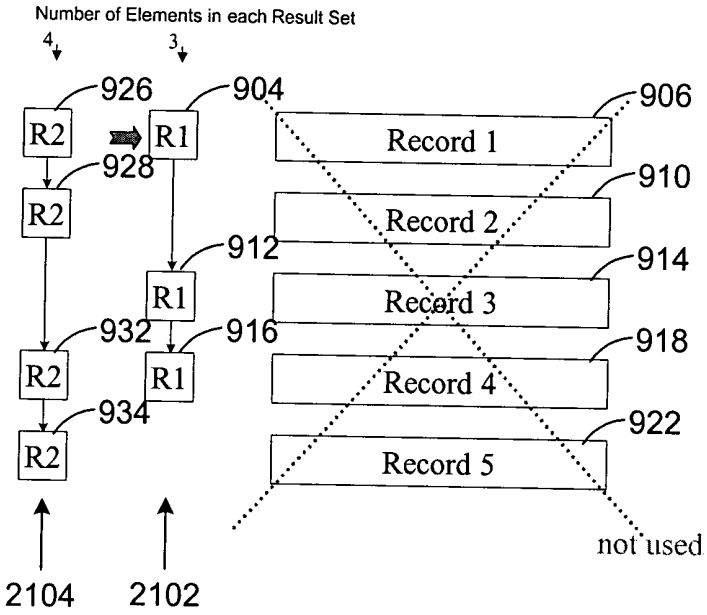
Number of Elements in each Result Set
4
3
926
904
906
R2
R1
Record 1
928
910
R2
Record 2
912
914
R1
Record 3
932
916
918
R2
R1
Record 4
934
922
R2
Record 5
not used
2104
2102

FIG. 21

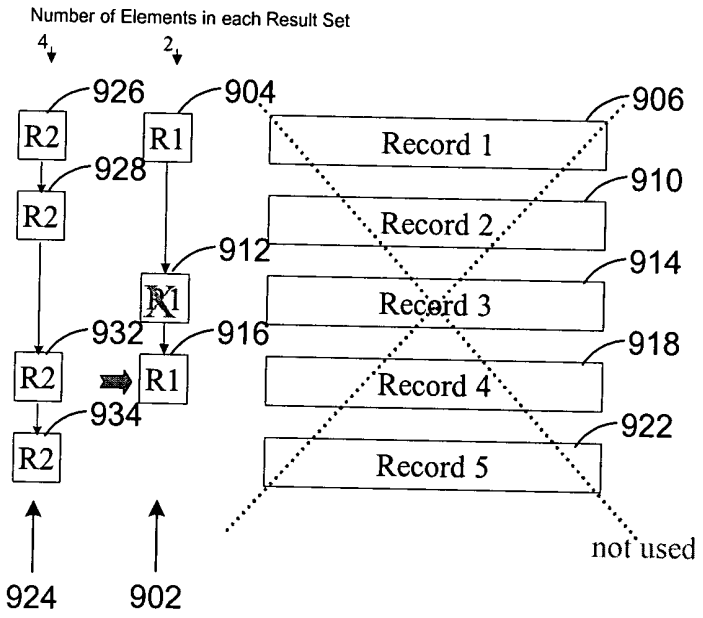
Number of Elements in each Result Set
4
2
926
904
906
R2
R1
Record 1
928
910
R2
Record 2
912
914
R1
Record 3
932
916
918
R2
R1
Record 4
934
922
R2
Record 5
not used
924
902

FIG. 22

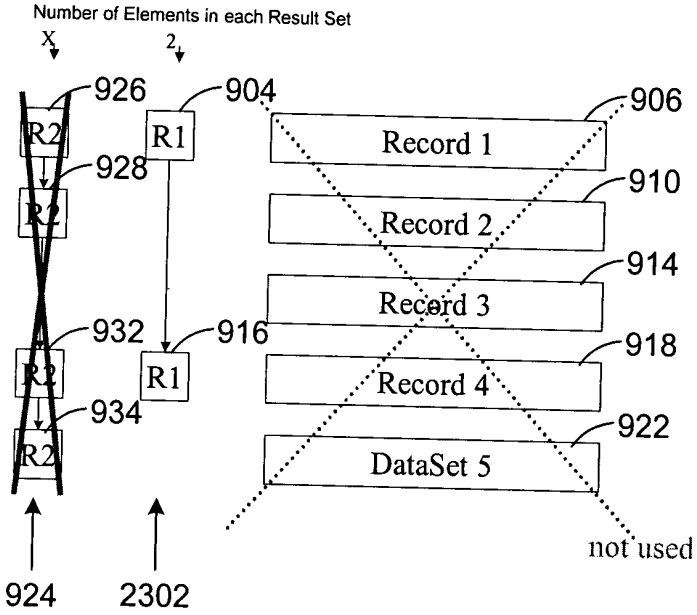
Number of Elements in each Result Set
X
2
926
904
906
R2
R1
Record 1
928
910
R2
Record 2
914
Record 3
932
916
918
R2
R1
Record 4
934
922
R2
DataSet 5
not used
924
2302

FIG. 23

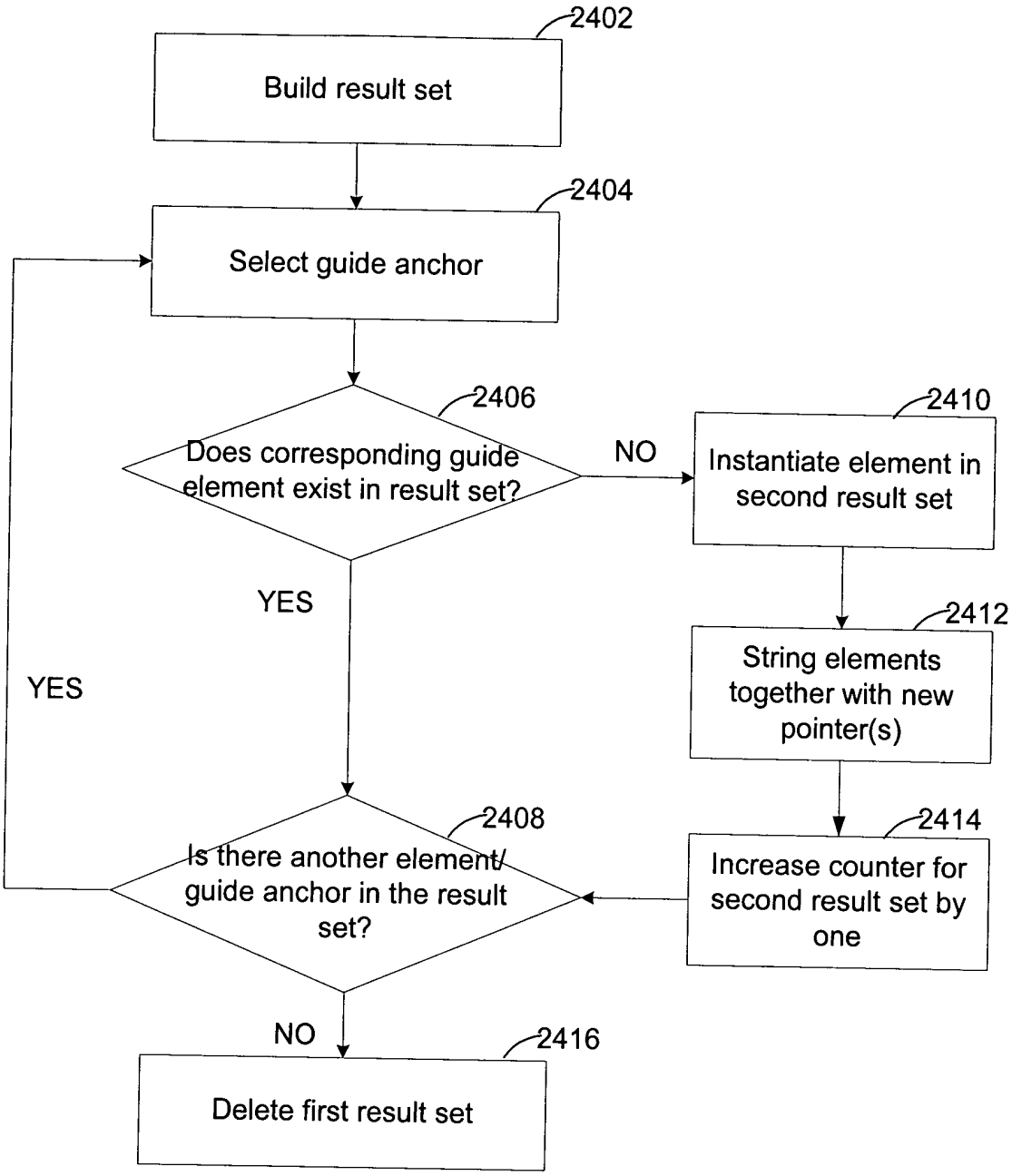
2402
Build result set
2404
Select guide anchor
2406
Does corresponding guide element exist in result set?
NO
2410
Instantiate element in second result set
YES
2412
String elements together with new pointer(s)
YES
2408
Is there another element/ guide anchor in the result set?
2414
Increase counter for second result set by one
NO
2416
Delete first result set

FIG. 24

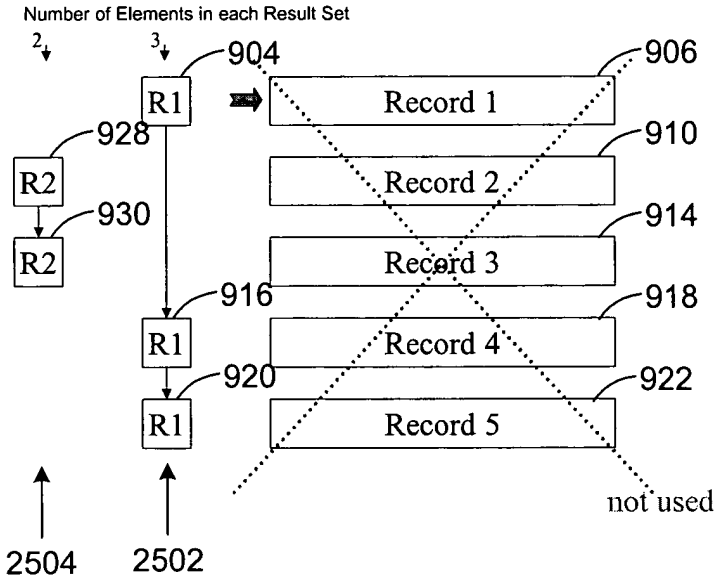
Number of Elements in each Result Set
2
3
904
906
R1
Record 1
928
910
R2
Record 2
930
914
R2
Record 3
916
918
R1
Record 4
920
922
R1
Record 5
not used
2504
2502

FIG. 25

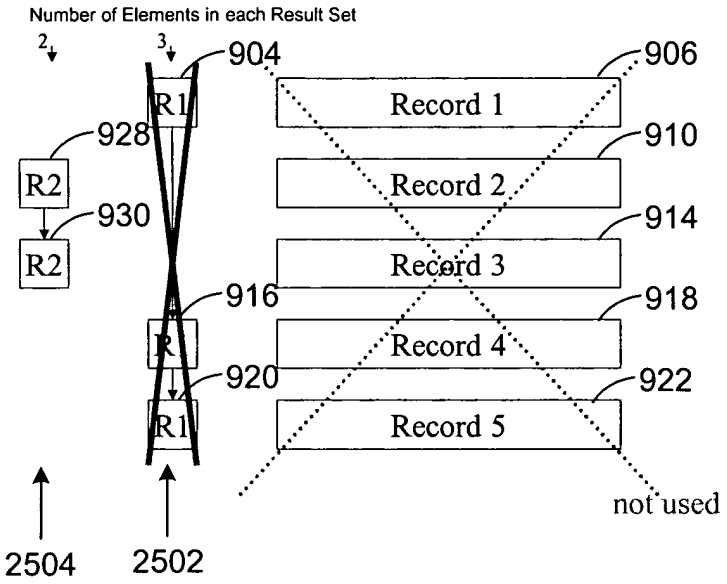
Number of Elements in each Result Set
2
3
904
906
R1
Record 1
928
910
R2
Record 2
930
914
R2
Record 3
916
918
R
Record 4
920
922
R1
Record 5
not used
2504
2502

FIG. 26

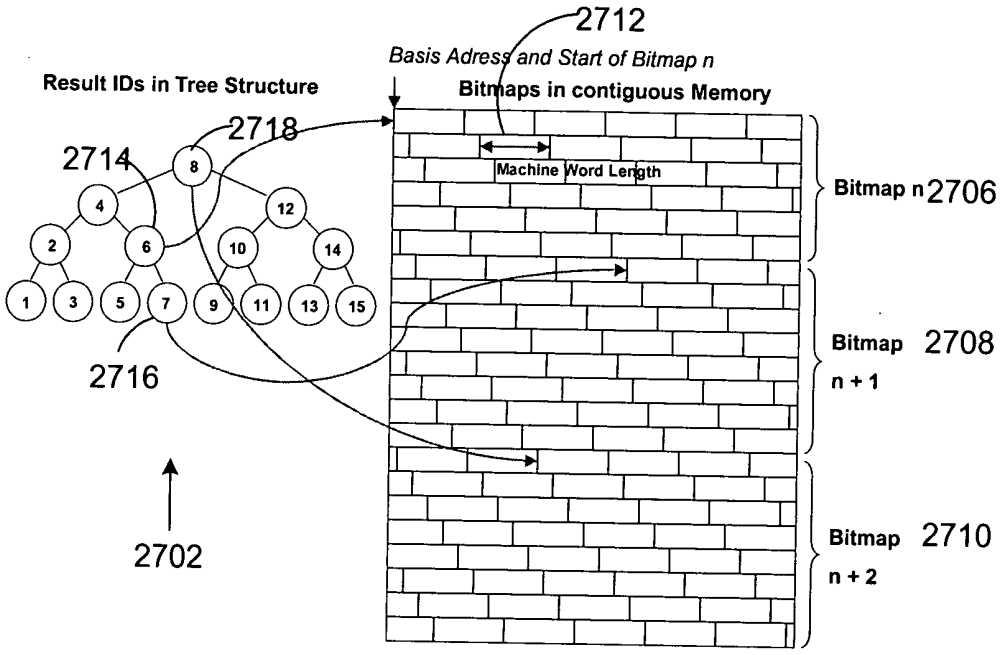
2712
Basis Adress and Start of Bitmap n
Result IDs in Tree Structure
Bitmaps in contiguous Memory
2718
2714
Machine Word Length
Bitmap n 2706
Bitmap 2708
n + 1
Bitmap 2710
n + 2
2716
2702

FIG. 27

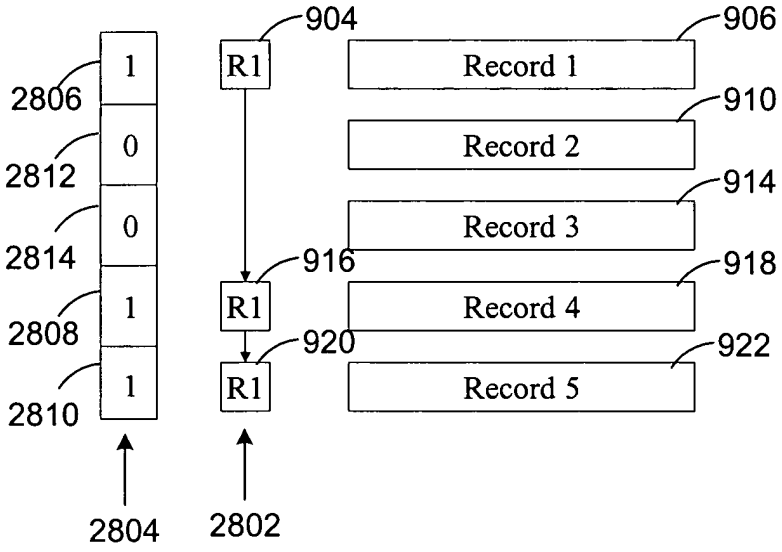
904
906
1
R1
Record 1
2806
910
0
Record 2
2812
914
0
Record 3
2814
916
918
1
R1
Record 4
2808
920
922
1
R1
Record 5
2810
2804
2802

FIG. 28

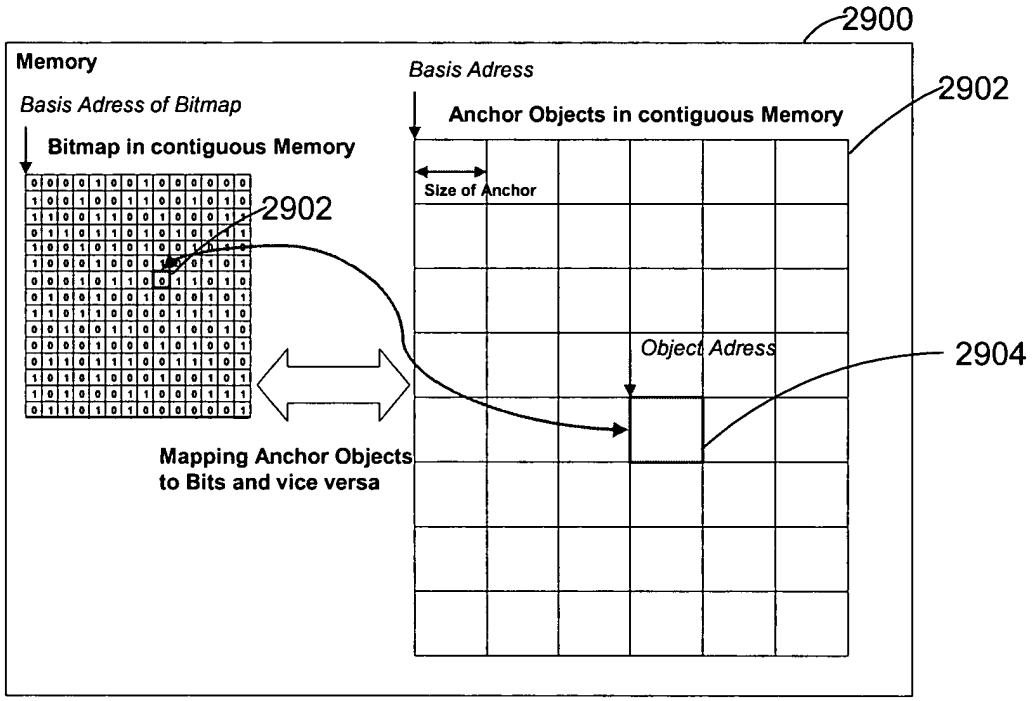
2900
Memory
Basis Adress of Bitmap
Bitmap in contiguous Memory
2902
Basis Adress
Anchor Objects in contiguous Memory
2902
Size of Anchor
Object Adress
2904
Mapping Anchor Objects
to Bits and vice versa

FIG. 29

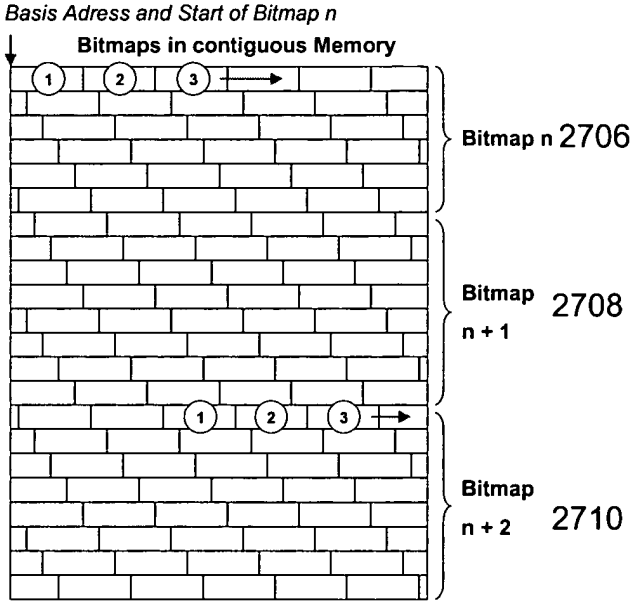
Basis Adress and Start of Bitmap n
Bitmaps in contiguous Memory
1
2
3
Bitmap n 2706
Bitmap n + 1 2708
1
2
3
Bitmap n + 2 2710

FIG. 30